STRUCTURE AND BRIDGE DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

SUBJECT: High Mast Light Poles: Inspection and Maintenance	**NUMBER:** SB-73 TED-346 **Date:** March 9, 2007
SIGNATURES: Kendal R. Walus, P.E./ Original Signed State Structure and Bridge Engineer R. J. Khoury, P.E./ Original Signed State Traffic Engineer	**SUPERCEDES: n/a**

Introduction: This memorandum addresses the following two issues concerning high mast light poles (HMLP): section loss at the base and cracking at the slip joints. Historically, weathering steel poles have experienced problems with both of these issues. As a result of this, we are the modifying the VDOT *Road and Bridge Specifications* to ensure that no additional weathering steel high mast poles are built. Though weathering steel poles are the foremost concern, the issue of section loss at the base of the poles may become an issue with galvanized HMLP as the galvanization deteriorates.

Discussion on Loss of Section at the Pole Base:

Two weathering steel materials were mainly used for HMLP: ASTM A588 and ASTM A595 Grade C. Shop plans from the late 1970's detail a backup ring and full penetration welds at the base. With moisture due to condensation collecting between the inside of the pole and the backup ring, pack rust will form over a period of time as corrosion of the pole continues.

Shop plans from one fabricator detail an additional stiffening tube on the inside between the outer pole and the back up ring and extending about 5 to 6 feet above the base plate. The fabricator refers to this as a two-ply pole (as opposed to a monotube section) and indicates that this was done in lieu of additional stiffening required in the vicinity of the hand hole area. The pole in this case was designed based on the section modulus of the outer pole section only.

In lieu of a more sophisticated analysis and to simplify the decisions involved with section loss of high mast light poles, the basic assumption is that the section loss is directly correlated to loss of thickness in the pole section. Since stress is proportional to the applied moment and section modulus is proportional to thickness, it can be shown that stress is inversely proportional to thickness.

The following chart indicates the increase in stress due to an incremental loss of section:

Percentage Loss of Section	Percentage Increase in Stress
10 %	11 %
15 %	18 %
20 %	25 %

Suggested Procedure for Determining Section Loss for Poles:

1. Remove hand hole cover and visually inspect the inside of the pole.

2. If visible corrosion is observed, especially in the vicinity of the lower end of pole toward the base plate, tap on the exterior of the pole to loosen any lensing or loosen corrosion particles.

3. At an approximate distance of 3 feet above the base plate, use an electronic thickness device to obtain three random readings around the circumference of the pole. The average of these three numbers may be assumed to be the thickness of the pole and should be recorded. The reading obtained is also valid for a two-ply pole as the device measures only the outermost thickness. To obtain accurate readings using the device, the inspector will need to grind the irregular weathered surface at measurement locations.

4. At an approximate distance of 1 1/2 inches above the base plate, obtain eight readings, one at each quarter point and one between each of these points on the circumference of the pole using an electronic thickness device and record the value.

5. If the inspector during the initial visual inspection observes other locations that should be checked for section loss, then additional thickness measurements should then be taken.

6. The smallest value of the readings from step 4 and 5 shall then be compared to the baseline thickness reading obtained in step 3.

7. % Section loss = $\left[\frac{1-(t\ \text{min.}\ \textit{from step}\ 4/5)}{(t\ \text{min.}\ \textit{from step}\ 3}\right] x\,100$

8. The course of action that should be taken based on the % section loss is indicated in the table given below.

Loss of Section at Base:

The following table shows the recommended guidelines to be followed due to the results of the inspection concerning the amount of corrosion in a HMLP:

Amount of Corrosion (Percentage Loss of Section)	**Action Required**
1 % to 15%	Increase Inspection Cycle from 60 months to every 24 months or less
15% to 20%	Pole should be removed from service within 6 months*
>20%	Pole should be removed from service immediately*

*Consideration of lowering the light assembly to reduce the loading on the pole should be made depending on the severity of the corrosion and forecasted weather conditions.

The required actions listed above have been correlated with the amount of resultant overstress felt to be prudent. While this is a simplification of the issue, it is felt that in general a more rigorous analysis is not warranted. The method for evaluating percent (%) section loss does not take into account other issues such as cracking induced by overstress, fatigue, and other visible adverse situations.

Cracking at Slip Joints:

HMLP fabricated with weathering steel with slip joints may experience wicking action that over a period of time that will result in cracking at the joints. In the past, the majority of the joints were sealed and stainless steel banding was applied to help extend the service life of these structures. However, recent inspections have revealed that some of the HMLP may have not been banded or sealed.

If cracks exist at the slip joint of the pole, whether banded or not, plans to remove the structure from service should be started immediately.

The general guidelines given above shall not take the place of sound engineering judgment in the evaluation of these structures.

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